

REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on May 7, 2003, and the references cited therewith. In response thereto, claims 1, 4-6 and 11 are amended, claims 2-3 are canceled, and claims 51-75 are reinstated. As a result, claims 1, 4-9, 11, 12, 14-23, 25-28, 33-37, 39-43, 45-75 are now pending in this application. Reconsideration of all pending claims is respectfully solicited.

Information Disclosure Statement

Applicant respectfully requests that a copy of the 1449 Form, listing all references that were submitted with the Information Disclosure Statement filed on April 7, 2003, marked as being considered and initialed by the Examiner, be returned with the next official communication.

Elections and Restrictions

Applicant notes that the Examiner has withdrawn the restriction between method and device claims in paper no. 7 and allows the "rejoinder of canceled claims." Applicant therefore has rejoined claims 51-75 in this Response as allowed by the Examiner.

Claim Objections

Claims 2 & 3 were objected to under 37 CFR 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claims 2 and 3 have been canceled thereby obviating the objections.

§112 Rejection of the Claims

Claims 1-9, 11-12, 14-23, 25-28, 33-37, 39-43 & 45-50 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The Law of Indefiniteness

The Board of Patent Appeals and Interferences has stated:

In rejecting a claim under the second paragraph of 35 U.S.C. § 112, it is incumbent on the examiner to establish that one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification, would not have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims. *Ex parte* Wu, 10 USPQ 2d 2031, 2033 (B.P.A.I. 1989) (citing *In re* Moore, 439 F.2d 1232, 169 USPQ 236 (C.C.P.A. 1971); *In re* Hammack, 427 F.2d 1378, 166 USPQ 204 (C.C.P.A. 1970)).

The M.P.E.P. adopts this line of reasoning, stating that:

The essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of:

- (1) The content of the particular application disclosure;
- (2) The teachings of the prior art; and
- (3) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. *M.P.E.P.* § 2173.02.

Antecedent Basis Errors in Claims 4-6

Applicant has corrected the antecedent basis errors in claims 4-6. Reconsideration of these claims is respectfully solicited.

Predetermined Shape [Claims 1-9]

Applicant intended that the phrase “predetermined shape” would find its interpretation in the specification and drawings of the present patent application. Applicant has defined the phrase “predetermined shape” to have a specific meaning as defined in the specification. For example, in the specification on page 8, lines 4-14, it states:

In Figure 1B, a plurality of openings or cavities 110 are formed in a surface 112 of the second layer 108 of forming material and in alignment with each of the

electrodes 104. The cavities 110 are formed down through the second layer 108, the nucleation layer 106 and partially through the first layer 102 of forming material to expose a top portion 114 of each of the electrodes 104. The electrodes 104 serve as an etch stop to define the bottom of each of the cavities 110. The cavities 110 are formed to have a predetermined shape by standard photolithographic techniques and can have a depth dimension D much larger than a diameter or width dimension W. The predetermined shape of the cavities 110 can be substantially cone-shaped and can have a substantially elliptical or circular cross-section as shown in Figure 2.

However, in the interest in furthering *ex parte* prosecution, Applicant has deleted the word “predetermined” and amended the offending claims to define the shape in a different manner. Since the Examiner indicated that deleting the word “predetermined” from the claims would remove this rejection, Applicant respectfully requests reconsideration of the claims.

Substantially Cone-Shaped [Claims 11-12, 14-23, 25-28, 33-37, 39-43 and 45-50]

Applicant respectfully submits that the term “substantially cone-shaped” is not confusing or ill defined in Applicant’s view. Applicant does not intend to use the word “cone” to be limited to a mathematically precise definition. Those skilled in the semiconductor art understand that the resulting structures from semiconductor fabrication are never a mathematical certainty. Rather, in sub-micron fabrication, the real-world resulting structures are often uneven, sometimes deformed and almost always rounded on the edges. By way of example, and not by limitation, Applicant has chosen the phrase “substantially cone-shaped” to refer to a substantially cylindrical shape (with a substantially elliptical or circular cross section) where one end is smaller in diameter than the other end and either end is flat (substantially frusto-conical or irregularly cylindrical) or substantially pointed (substantially conical).

Applicant respectfully submits that the phrase “substantially cone-shaped” is understood by those skilled in the art and no correction of claims 11-12, 14-23, 25-28, 33-37, 39-43 and 45-50 is required. Applicant respectfully requests reconsideration of these claims and removal of the rejection under 35 U.S.C. § 112, second paragraph.

Forming Material [Claims 14, 17, 18, 21-23, 26-28, 35-37, 40-43 and 47-50]

The phrase “forming material” also finds its definition (or its antecedent description) in the specification of the present patent application. It is axiomatic that a patent attorney is his own lexicographer and can therefore assign specific meanings to claim words as defined in the specification and shown in the drawings. For example, in the specification, on page 3, lines 4-14, it states:

In accordance with an embodiment of the present invention, a capacitor includes a layer of forming material and a nucleation layer formed on the layer of forming material. A substantially cone-shaped first plate of conductive material includes a vertex portion extending through the nucleation layer and partially into the layer of forming material. At least one of an interior surface and an exposed exterior surface of the first plate extending from the layer of forming material and the nucleation layer can be converted to hemispherical grains. A layer of dielectric material is formed on the nucleation layer and on the interior surface and the exposed exterior surface of the first plate. The dielectric layer substantially conforms to the shape of the first plate and the hemispherical grains. A second plate of conductive material is formed over the dielectric layer.

Further, the makeup of the forming layer is defined in the present specification on page 7, lines 21 through 27:

Figures 1A-1H illustrate the operations in forming a capacitor or an array of capacitors 100 in accordance with the present invention. In Figure 1A, a first layer 102 of forming material is deposited or formed. **The first layer 102 of forming material can be a doped oxide or the like.** A plurality of electrodes 104 can be formed in the first layer 102 of forming material by conventional photolithographic techniques. The electrodes 104 can have a selected pitch or spacing S between them. The electrodes 104 can be made of a metal or semiconductive material. [Emphasis Added]

Thus, Applicant respectfully submits that the phrase “forming material” cannot be assigned such a broad interpretation as suggested by the Examiner. The forming material is not any layer in the capacitor. It is the support on which all other layers are built. Applicant respectfully submits that using an overly broad definition for these claims terms places these claims in an unfair light and allows the Examiner to incorrectly assume that the claims are too

broad, and that Applicant should be “punished”¹ even though Applicant has properly defined the invention within the bounds of the law.

Applicant respectfully submits that the phrase “forming material” is understood by those skilled in the art and no correction of claims 14, 17, 18, 21-23, 26-28, 35-37, 40-43 and 47-50 is required. Applicant respectfully requests reconsideration of these claims and removal of the rejection under 35 U.S.C. § 112, second paragraph.

Nucleation Layer [Claims 18, 21-23, 28, 36, 37, 42, 48 and 49]

The phrase “nucleation layer” also finds its definition (or its antecedent description) in the specification of the present patent application. Once again, Applicant’s patent attorney can assign specific meanings to claim words and phrases as defined in the specification and shown in the drawings. Further, the phrase “nucleation layer” is used in a manner which is not inconsistent with its meaning as used by those skilled in this art area. For example, the makeup of the “nucleation layer” is defined in the present specification on page 7, line 27 through page 8, line 3:

A nucleation layer 106 can be formed on the first layer 102. The nucleation layer 106 can be formed from an undoped oxide or the like. A second layer 108 of forming material can be formed on the nucleation layer 106. The second layer 108 of forming material can also be a layer of doped oxide or the like. The nucleation layer 106 can be much thinner than the first layer 102 of forming material and the second layer 108 of forming material can be much thicker than the first layer 102.

Applicant respectfully submits that the phase “nucleation layer” should not be assigned such a broad interpretation as suggested by the Examiner. The nucleation layer is not “any layer that has a thin overlying dielectric layer deposited on it.” Nucleation layers are well defined in the art.²

¹ See extraneous, damaging and potentially biased remarks made by the Examiner on page 3 of this Office Action mailed May 7, 2003. The admitted “personal beliefs and intuition” described in this Office Action by the Examiner suggest that the Applicant in this case may not get a fair and unbiased examination.

² For a detailed description of the role nucleation layers in semiconductor fabrication, search on “nucleation layer” in anyone of the many Internet search engines, such as Google™

Therefore, Applicant respectfully submits that the phrase “nucleation layer” is well understood by those skilled in the art and no correction of claims 8, 21-23, 28, 36, 37, 42, 48 and 49 should be required. Applicant respectfully requests reconsideration of these claims and removal of the rejection under 35 U.S.C. § 112, second paragraph.

§102 First Rejection of the Claims

Claims 1-3, 7 and 9 were rejected under 35 U.S.C. § 102(b) as being anticipated by Gray and Meyer (Undergraduate Textbook). Claims 2 and 3 have been deleted thereby obviating the rejection of claims 2 and 3. Applicant respectfully traverses this rejection as to claims 1, 7 and 9.

Every word in a claim must be given weight in interpreting the claims. Applicant respectfully submits that the clear claim limitation of a “predetermined shape” as defined by applicant’s specification was not given any patentable weight. Nonetheless, Applicant has amended claim 1 to describe the shape as “substantially cone-shaped” to facilitate *ex parte* prosecution of the Applicant’s pending claims.

The undergraduate textbook cited by the Examiner discloses a flat capacitor on a substrate. Claims 1, 7 and 9 require a substantially cone-shaped structure for the shape of the first plate, dielectric and second plate. Since all of the limitations of these claims are not found in a single reference, the rejection under 35 U.S.C. § 102(b) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 1, 7 and 9.

§102 Second Rejection of the Claims

Claims 1-4, 9, 11, 14-16, 18-20, 22, 26 and 28 were rejected under 35 U.S.C. § 102(e) as being anticipated by Ooto et al. (U.S. 6,215,187). Claims 2 and 3 have been deleted thereby obviating the rejection of these claims. Applicant respectfully traverses this rejection based upon the amendments to the remaining claims and in light of the remarks offered below in support of patentability.

U.S. 6,215,187 to Ooto et al. is a reference under 35 U.S.C. § 102(e) and therefore may be removable. However, Applicant chooses at this time to merely distinguish the Ooto et al. patent and reserves the right to swear behind the Ooto et al. patent at a later date.

The Ooto et al. patent describes several embodiments of a vertical container capacitor which is alternatively shaped as two frusto-conical shaped stacked openings, a pillar-shaped opening or an inverted frusto-conical shape (described as prior art). It is this latter description which is relied upon by the Examiner found in Figures 22-28 which are described by Ooto et al. as prior art. The Ooto et al. patent fails to disclose and interior and exterior surface of the vertical capacitor. Instead, the Ooto et al. patent describes a supporting dielectric material 105j which supports the capacitor.

All elements of a claim rejected under 35 U.S.C. § 102 must be found in the single reference cited by the Examiner. If all elements are not found, the rejection fails.

In contrast to the Ooto, et al patent, claims 1, 4, 9, 11, 14-16, 18-20, 22, 26 and 28 all require an interior surface and exterior surface of a capacitor to produce a container capacitor of superior storage capacity in a small dimension.

Since all of the limitations of these claims are not found in a single reference, the rejection under 35 U.S.C. § 102(e) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 1, 4, 9, 11, 14-16, 18-20, 22, 26 and 28.

§103 First Rejection of the Claims

Claims 12, 17, 21, 23, 25 and 27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ooto et al. (U.S. 6,215,187) as applied to claims 11, 14, 18 & 22 above, and further in view of Watanabe et al. (1995 IEEE Article). Applicant respectfully traverses this rejection based upon the amendments to the claims and in light of the remarks offered below in support of patentability.

U.S. 6,215,187 to Ooto et al. is a reference under 35 U.S.C. § 102(e) and therefore may be removable. However, Applicant chooses at this time to merely distinguish the Ooto et al. patent and reserves the right to swear behind the Ooto et al. patent at a later date.

As described above, nowhere in the Ooto et al. patent does it describe a capacitor having interior and exterior surfaces which are plates and dielectrics of the capacitor. There is no suggestion of using interior surfaces and no suggesting the use of HSG surfaces. The Watanabe et al. paper describes early work in creating short HSG cylindrical electrodes. There is no mention of creating tall container capacitors of the type described by Applicant's invention. In

contrast to the combination of the Wanatabe et al. paper and the Ooto et al. patent, the present invention describes substantially cone-shape structures with interior and exterior HSG surfaces.

All elements of a claim rejected under 35 U.S.C. § 103(a) must be found in the combination of references cited by the Examiner. If all elements are not found, the rejection fails. Since all of the limitations of these claims are not found in the combination of references, the rejection under 35 U.S.C. §103(a) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 12, 17, 21, 23, 25 and 27.

§103 Second Rejection of the Claims

Claims 12, 17, 21, 23, 25 and 27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ooto et al. (U.S. 6,215,187) as applied to claim 1 above, and further in view of Yoshida et al. (U.S. 6,166,941). Applicant respectfully traverses this rejection based upon the amendments to the claims and in light of the remarks offered below in support of patentability.

U.S. 6,215,187 to Ooto et al. is a reference under 35 U.S.C. § 102(e) and therefore may be removable. However, Applicant chooses at this time to merely distinguish the Ooto et al. patent and reserves the right to swear behind the Ooto et al. patent at a later date.

As described above, nowhere in the Ooto et al. patent does it describe a capacitor having interior and exterior surfaces which are plates and dielectrics of the capacitor. There is no suggestion of using interior surfaces and no suggesting the use of HSG surfaces. The Yoshida et al. patent describes a layout of storage nodes which is nothing like the layout of the nodes of the present invention. In contrast to the combination of the Yoshida et al. patent and the Ooto et al. patent, the present invention describes substantially cone-shape structures with interior and exterior HSG surfaces.

All elements of a claim rejected under 35 U.S.C. § 103(a) must be found in the combination of references cited by the Examiner. If all elements are not found, the rejection fails. Since all of the limitations of these claims are not found in the combination of references, the rejection under 35 U.S.C. §103(a) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 12, 17, 21, 23, 25 and 27.

§103 Third Rejection of the Claims

Claims 33, 35, 36, 40, 42, 43, 45, 47, 48 and 50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ooto et al. (U.S. 6,215,187) as applied to claims 12, 14 and 18 above, and further in view of Burns and Bond (Undergraduate Textbook). Applicant respectfully traverses this rejection based upon the amendments to the claims and in light of the remarks offered below in support of patentability.

U.S. 6,215,187 to Ooto et al. is a reference under 35 U.S.C. § 102(e) and therefore may be removable. However, Applicant chooses at this time to merely distinguish the Ooto et al. patent and reserves the right to swear behind the Ooto et al. patent at a later date.

As described above, nowhere in the Ooto et al. patent does it describe a capacitor having interior and exterior surfaces which are plates and dielectrics of the capacitor. There is no suggestion of using interior surfaces and no suggesting the use of HSG surfaces. The Burns and Bond paper describes early work in creating memory devices and arrays. In contrast to the combination of the Burns and Bond paper and the Ooto et al. patent, the present invention describes substantially cone-shape structures with interior and exterior HSG surfaces.

All elements of a claim rejected under 35 U.S.C. § 103(a) must be found in the combination of references cited by the Examiner. If all elements are not found, the rejection fails. Since all of the limitations of these claims are not found in the combination of references, the rejection under 35 U.S.C. §103(a) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 33, 35, 36, 40, 42, 43, 45, 47, 48 and 50.

§103 Fourth Rejection of the Claims

Claims 34, 37, 39, 41, 46 and 49 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ooto et al. (U.S. 6,215,187) in view of Burns and Bond as applied to claims 33, 36, 40, 45 and 48 above, and further in view of Watanabe et al. (1995 IEEE Article). Applicant respectfully traverses this rejection based upon the amendments to the claims and in light of the remarks offered below in support of patentability.

U.S. 6,215,187 to Ooto et al. is a reference under 35 U.S.C. § 102(e) and therefore may be removable. However, Applicant chooses at this time to merely distinguish the Ooto et al. patent and reserves the right to swear behind the Ooto et al. patent at a later date.

As described above, nowhere in the Ooto et al. patent does it describe a capacitor having interior and exterior surfaces which are plates and dielectrics of the capacitor. There is no suggestion of using interior surfaces and no suggesting the use of HSG surfaces. The Burns and Bond paper describes early work in creating memory devices and arrays. The Watanabe et al. paper describes early work in creating short HSG cylindrical electrodes. There is no mention of creating tall container capacitors of the type described by Applicant's invention. In contrast to the combination of the Watanabe et al. paper, the Burns and Bond paper and the Ooto et al. patent, the present invention describes substantially cone-shape structures with interior and exterior HSG surfaces.

All elements of a claim rejected under 35 U.S.C. § 103 must be found in the combination of references cited by the Examiner. If all elements are not found, the rejection fails. Since all of the limitations of these claims are not found in a combination of references, the rejection under 35 U.S.C. §103(a) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claims 34, 37, 39, 41, 46 and 49.

§103 Fifth Rejection of the Claims

Claim 8 was rejected under 35 U.S.C. § 103(a) as being unpatentable Gray and Meyer as applied to claim 1 above, and further in view of Official Notice. Applicant respectfully traverses this rejection based upon the amendments to the claims and in light of the remarks offered below in support of patentability.

The Examiner is taking Official Notice that a capacitor plate of 300 angstroms is obvious to those skilled in the art using routine experimentation. Applicant respectfully points out that if this is so notoriously known, why can't a reference be found to substantiate this claim? Applicant believes no one but the Applicant has done so. Applicant respectfully traverses this official notice and requests the Examiner to provide a reference that describes such an element. Absent a reference, it appears that the Examiner is using personal knowledge, so the Examiner is respectfully requested to submit an affidavit as required by 37 C.F.R. § 1.104(d)(2).

The Examiner rejected claim 8 based on Gray and Meyer reference. Applicant respectfully traverses the single reference rejection under 35 U.S.C. § 103 since not all of the recited elements of the claims are found in this reference by admission of the Examiner. Since

all the elements of the claim are not found in the reference, the Examiner is taking Official Notice of the missing elements. Applicant respectfully objects to the taking of Official Notice with a single reference obviousness rejection and, pursuant to M.P.E.P. § 2144.03, Applicant respectfully traverses the assertion of Official Notice and requests that the Examiner cite references in support of this position.

As described above, nowhere in the Gray and Meyer reference does it describe a capacitor having interior and exterior surfaces which are plates and dielectrics of the capacitor. There is no suggestion of using interior surfaces and no suggesting the use of HSG surfaces.

All elements of a claim rejected under 35 U.S.C. § 103(a) must be found in the combination of references cited by the Examiner. If all elements are not found, the rejection fails. Since all of the limitations of this claim is not found in a combination of references, the rejection under 35 U.S.C. §103(a) fails. Applicant respectfully requests reconsideration of this rejection and allowance of claim 8.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6904 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743

Respectfully submitted,

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Date

Oct. 7, 2003

By

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, P.O.Box 1450, Alexandria, VA 22313-1450, on this 7 day of October, 2003.

Name

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Signature

[Signature]